MULTIMEDIA UNIVERSITY

STUDENT ID NO

Seat No.: | | | |

Venue: _____

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2016/2017

TGD2151 – COMPUTER GRAPHICS FUNDAMENTALS
TCS2111 - COMPUTER GRAPHICS

(All sections / Groups)

28 FEBRUARY 2017
2.30 p.m. – 4.30 p.m.
(2 Hours)

Question No.	Marks
1	
2	
3	
4	
Total	

INSTRUCTIONS TO STUDENTS

1. This Question Paper consists of 7 pages with 4 Questions only.

2. Answer **ALL FOUR** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers CLEARLY in this Question Paper.

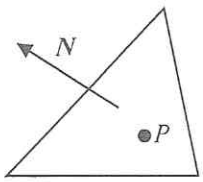
QUESTION 1

a) Given a flat surface with normal vector (2, 5, 1), determine whether the surface is visible to:

i) Viewer A looking at direction (4, 0, 1). [1.5 marks]

ii) Viewer B looking at direction (4, -2, 1). [1.5 marks]

b) Find the plane equation for a triangle with normal vector $N = (2, 5, 1)$ and a point P (1, 0, 7) falls on the triangle as illustrated below. [2 marks]



c) Given the pixel display region, using Z-buffer algorithm, determine the rendering of a red quad that covers the region in dotted line below and with the equation 2x + 3y – z = 2. Assume that the background of the display is in black color. [Instruction: Let **R** to be red color and **B** to be black color] [5 marks]

-1	-1	-1	-1
-1	-1	-1	-1
-1	-1	-1	-1
-1	-1	-1	-1

Z- buffer

B	B	B	B
B	B	B	B
B	B	B	B
B	B	B	B

Frame buffer

Continued...

QUESTION 2

a) Define the following: [3 marks]
i) Global Illumination
ii) Diffuse reflection
iii) Specular reflection

Continued...

b) Compute the intensity of the ambient light and diffuse reflection at a cube if the unit light vector $\boldsymbol{L}$ is (-0.707, 0, 0.707), normal vector $\boldsymbol{N}$ is (0, 0, 1), intensity of the ambient and diffuse light are $I_a = 0.8$ and $I_d = 0.9$ respectively, and the coefficient of the ambient and diffuse light are $K_a = 0.5$ and $K_d = 0.5$.

[3 marks]

c) Draw and label the **Parallel** projection and **Perspective** projection based on the following details:

Parallel projection: glOrtho(-2, 2, -3, 3, 0, 10); [2 marks]

Perspective projection: gluPerspective(30, 2, 0, 10); [2 marks]

Parallel projection	**Perspective** projection

Continued...

QUESTION 3

a) Given two pixel coordinates (1, 3) and (5, 4), complete the following table for the pixel coordinates in between the two pixels using Bresenham's algorithm below:

$F_k < 0$: $y_{k+1} = y_k$ Hence, $F_{k+1} = F_k + 2h$

$F_k \geq 0$: $y_{k+1} = y_k + 1$ Hence, $F_{k+1} = F_k + 2(h - w)$

[3 marks]

$F_0 = 2h - w$

K	F_k	X_k	Y_k
0		1	3

b) Compare the line drawing algorithm between Analytical method and Bresenham's algorithm. Give two comparisons. [2 marks]

Analytical method	Bresenham's algorithm

c) Cohen Sutherland's clipping algorithm is commonly used to solve the line clipping problems.

i) Sketch a diagram and specifies the clipping window and the corresponding region codes. [2 marks]

ii) Explain by examples that a line is in condition of "Trivial accept", "Trivial reject" and "Others". [3 marks]

Continued...

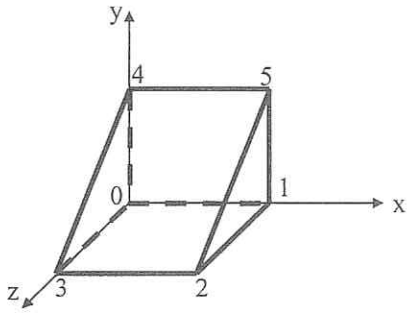
QUESTION 4

a) Find a 2D composite matrix in homogeneous form if we rotate an object 90 degree anti-clock wise order about z-axis and translate the object by (4, 5).

[3 marks]

Continued...

b) i) Complete the Face List and Normal List for the object below. [4 marks]



Face List			
P_w	P_x	P_y	P_z
	2		4
	0		5
	3		1
	2		-1
4	0	3	-1

Normal List		
N_x	N_y	N_z
0	0.577	0.577

ii) Proof that the object is a polyhedron. [1 mark]

c) What is the frame buffer size in KB for the resolution 1280 by 640 that stores 8 bits per pixel? [2 marks]

End of Page!